

Rhodora

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THE NEW ENGLAND BOTANICAL CLUB

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THE MARINE CLADOPHORAS OF NEW ENGLAND.

F. S. COLLINS.

(Plate 36.)

THERE is probably no other genus of algae which has a distribution so universal, both in fresh and salt water, as *Cladophora*. Its range includes extreme northern and southern latitudes and all regions between, including every possible station where the plant can be submerged all or part of the time. Species of *Cladophora* sometimes constitute dense attached masses of great extent in lakes and rivers, or floating strata in quiet waters; the fresh water species are not so numerous as the marine, however, and the latter are found in almost every station where algae can grow at all. Exposed rocky shores, quiet bays, still lagoons, marsh creeks, all are apt to abound with these plants. If we except loose sandy beaches, where no algae of any kind can grow, there is probably not a stretch of a few rods in all New England, reached by salt or brackish water, where *Cladophoras* cannot be found, at least in spring or summer.

There is seldom any difficulty in determining whether a plant belongs to this genus; the generic characters are clear enough, but there is perhaps no genus of New England algae that is so distinct from all other genera as the genus *Cladophora*, and at the same time contains so many species of vague characters and uncertain limits. Both in the matter of determining a particular specimen collected and in the matter of ascertaining some definite principles, by which the almost innumerable forms may be arranged in natural and easily recognized groups, it offers great difficulties.

Founded in 1843 by Kützing¹ it includes those species of the

¹ *Linnaea*, Vol. XVII, p. 91, 1843.

older genus *Conferva* which have fronds composed of repeatedly branching, monosiphonous, articulated filaments. The fruit in all is substantially the same; the contents of practically any cell in the frond may be transformed into numerous zoospores, which escape through an opening in the side wall. The shape of the cell is only slightly if at all changed in this process. Kjellman¹ has attempted to use characters derived from these fruiting cells for the distinction of species among the Scandinavian *Cladophoras*, but it is doubtful if the characters he uses will be found available generally. There remain for distinction only vegetative characters; — the size of the frond as a whole, the diameter and length of cells in the main filaments and their branches; the arrangement of the latter, alternate, opposite, whorled or secund; the angle at which they issue; their straightness or curvature, acuteness or bluntness; the shade of color; and finally, the presence or absence of special rhizoidal or spinous branches in addition to the normal ramification. All these characters vary much according to external conditions, and also with the age of the individual plant, so that a knowledge of a species as it appears in different environments, and an acquaintance with all stages of growth are necessary before an attempt can be made at drawing specific lines. Add to this the fact that most of the species seem to be still in an evolutionary state, and connected by innumerable intermediate forms, and it will be seen that the identification of a specimen with some one of the 300 described species, often very loosely and insufficiently characterized, is no easy matter.

On the other hand, there is the advantage that none of these characters requires careful microscopic study. In most cases a pocket lens will give all the characters needed, and in some cases even the pocket lens is unnecessary; while a magnification of 40 or 50 diameters will furnish all that can be needed in any case. The trouble is not in perceiving the characters, it is in keeping in mind the type for each species, and deciding what relative weight to give to apparently contradictory characters; to decide what is really characteristic of the species, what due to external conditions.

The number of species occurring on the New England coast is quite limited, but even as to these few the lines of demarcation are

¹ Studier öfver Chlorophycésläktet *Acrosiphonia* J. G. Ag. och dess Skandinaviska Arter. Bihang till K. Svenska Vet.-Akad. Handlingar, Band. 18, Afd. III, No. 5, Stockholm, 1893.

indistinct, and their identity with European types is unsettled. Harvey¹ credits to the New England coast 11 species of the 19 which he describes for North America. Farlow² gives 14 species and 3 varieties. A familiarity for quite a number of years with the plants as they grow along our shore, has led the writer to conclude that some changes should be made in these lists, and the present paper is intended to give a revised list, with the principal characters; 17 species, 6 varieties and 3 forms being included.

In determining a specimen, a good plate is better than any description, and an authentic specimen in good condition is better than any plate. References have therefore been made in the following pages, under each species, to such books and sets of exsiccatae as are likely to be found at the principal botanical and educational centers, and will be of most assistance to the student. The references to Harvey, LeJolis and Hauck have in almost all cases been verified by authentic specimens in the Farlow Herbarium at Cambridge and in the writer's collection. In the case of the older authors, such as Roth and Dillwyn, authentic specimens have not been obtainable, but wherever there seems to be reason for doubting an identification, the doubt has been indicated. Plate 36, accompanying this paper, is intended to supplement the descriptions, chiefly as to the lesser branches of the various species. The figures should be considered as schematic, rather than as accurate drawings to scale.

Of the three subgenera, *Aegagropila*, *Spongomorpha* and *Eucladophora*, the first is not represented by any marine species in this region. *Spongomorpha*, with plants densely matted in the lower part or throughout by special hooked branches or by descending rhizoidal filaments, and *Eucladophora*, which lacks these special branches, are both common. A not absolutely accurate, but perhaps useful key to our species, may be found in the following:

ARTIFICIAL KEY TO THE NEW ENGLAND SPECIES OF CLADOPHORA.

Filaments matted together by descending rhizoidal filaments or hooked branches in the older parts. SPONGOMORPHA. a

Filaments free or more or less intertwined, but not matted together by special branches. EUCLADOPHORA. d

¹ *Nereis Boreali-Americana*, part 3, Smithsonian Contributions to Knowledge, Washington, 1858.

² *Marine Algae of New England and adjacent coast*, Report of the U. S. Fish Commission for 1879, Washington, 1881.

- a. Filaments 20-40 μ diameter. *C. lanosa.*
- a. " 50 μ diameter or more. b
- b. Older parts of the frond abundantly furnished with curved, hooked or circinate branches with very acute tips; cells in older part of frond $\frac{1}{2}$ -1 diam. long. *C. spinescens.*
- b. Hooked branches few or none; filaments usually increasing in diameter upwards; terminal cells blunt; more or less matted below by rhizoidal filaments. c
- c. Filaments about 60 μ below, 100 μ above; cells usually 2-4 diameters long. *C. arcta.*
- c. Filaments about 100 μ below, 150-250 μ above; cells, except near the tips, $\frac{1}{2}$ -1 $\frac{1}{2}$ diameters long. *C. Hystris.*
- d. Filaments slender, usually 40-60 μ diameter, pale green, densely interwoven into a spongy mass. *C. albida.*
- d. Filaments free or somewhat interwoven, not spongy. e
- e. Fronds attached only in the early stages, soon detached and forming dense floating masses in shallow warm water. f
- e. Fronds remaining attached throughout the whole active life. g
- f. Main filaments 100-150 μ , branches much smaller, divaricate; ultimate ramuli secund. *C. expansa.*
- f. Main filaments seldom over 100 μ diameter, branches of successive orders gradually smaller, ultimate ramuli not conspicuously secund. *C. fracta.*
- g. Filaments and main branches usually under 100 μ diameter. h
- g. " " " " " over 100 μ " l
- h. Fronds soft and silky, utterly collapsing when taken from the water. i
- h. " firmer. j
- i. Cells 6-20 diameters long; plant of sheltered bays. *C. Rudolphiana.*
- i. " 2-6. " " ; usually in upper rock tide pools. *C. glaucescens.*
- j. Filaments short, rigid, more or less creeping; branches few. *C. Magdalenae.*
- j. Fronds freely branched. k
- k. Branches recurved, pectinated with similar recurved branchlets. *C. refracta.*
- k. Branches regularly flexuous throughout the frond. *C. flexuosa.*
- l. Filaments rigid; plants of exposed rocky shores. m
- l. Filaments not rigid. n
- m. Filaments dark green, branches erect or appressed, opposite or whorled. *C. rupestris.*
- m. Filaments lighter in color, ultimate ramuli blunt, short, densely packed at the ends of the branches; branching chiefly alternate. *C. laetevirens.*
- n. Filaments 100-250 μ diameter; ultimate ramuli stout, blunt, constricted at nodes. *C. Hutchinsiae.*
- n. Filaments 40-150 μ diameter; ultimate ramuli slender, not constricted at nodes. o
- o. Filaments with comparatively few main branches, beset throughout with short, patent, often secund ramuli. *C. hirta.*
- o. Filaments much branched, branches of successive orders decreasing in size, the tips set with series of secund, patent ramuli. *C. gracilis.*

In considering the species in detail, it appears that the subgenus Spongomorpha should rank higher than Eucladophora, the species of the former having the branches differentiated, part being normal and erect, part rhizoidal and descending; in some species there is a

third type, hooked, curved or circinate, while the normal filaments are straight and erect. In the species of *Eucladophora* the branches vary in length and diameter, but not otherwise. In Kjellman's paper before mentioned he uses the generic name *Acrosiphonia* with practically the same extension as *Spongomorpha*, giving as his reason that the characters given by J. G. Agardh¹ are essential characters of the genus, while those given by Kützinger² are non-essential and uncertain. As, however, the earlier name *Spongomorpha* has been generally received, either as a genus or a subgenus, while *Acrosiphonia* appears to have been dropped by the author and forgotten, the earlier name can hardly be displaced, under any system of nomenclature. Whether its rank should be generic or subgeneric is more of an open question; in the present paper it is treated as a subgenus. Apart from the question of the rank of *Spongomorpha* and *Aegagropila*, there is no question as to the extent and limitations of the genus *Cladophora*.

CLADOPHORA.

Frond consisting of articulate, branched, monosiphonous filaments, with terminal or intercalary growth. Cells cylindrical or subcylindrical, plurinuclear, with disk-shaped, parietal chromatophores.

SUB-GENUS SPONGOMORPHA.

Fronds with normal erect filaments, increasing in diameter upwards, with long terminal cell from which cells are successively cut off below; these cells continuing to divide, so that the cells in the older parts of the filaments are much shorter than those in the growing tips; also with descending rhizoidal filaments, and in some species patent, acute, hooked or curved branches, the older fronds being more or less densely matted together by the descending or patent branches.

C. ARCTA (Dillw.) Kütz.

Kützinger, Phyc. Germ., p. 207.

Harvey, Phycologia Britannica, Pl. CXXXV; *Nereis Boreali-Americana*, part 3, p. 75.

¹ J. G. Agardh, *Anadema*, *Novum Genus Algarum*, p. 12, Stockholm, 1848.

² Kützinger, *Phycologia Generalis*, p. 273, 1843.

Le Jolis, Algues Marines de Cherbourg, p. 64.

Hauck, Deutschlands Meeresalgen, p. 445.

De Toni, Sylloge Algarum, Vol. I, p. 335.

Farlow, New England Marine Algae, p. 50.

Hauck and Richter, Phycotheca Universalis, Nos. 13, 426.

Collins, Holden and Setchell, Phycotheca Boreali-Americana, Nos. 224, 815.

Conferva arcta, Dillwyn, British Confervae, p. 67, Plate E.

Fronds rich green, in dense tufts, fastigiate, about 60–100 μ diameter, cells 4–6 diameters in the growing tips, $1\frac{1}{2}$ –3 diameters in other parts of the frond; erect, stiff, much branched, branches erect or appressed, obtuse or clavate, giving off descending rhizoid-like branches, 40–60 μ diameter, cells several diameters long, by which the lower part of the tuft is firmly matted together.

A spring plant, appearing as early as February in favorable localities; at first a bright rich green, becoming darker and duller in the older plant. Found along the whole New England coast, it is more common and luxuriant in the northern half, less from climatic conditions than from the prevalence of exposed rocky shores, which are its special habitat. At Newport, R. I., where favorable conditions occur, it is abundant and luxuriant.

In most of the references quoted above, the species is taken in a wide sense, and would probably include *C. Sonderi* and *C. spinescens*, here considered distinct. The exsiccatæ quoted, however, are *C. arcta* as here understood.

C. HYSTRIX (Strömfelt) De Toni.

De Toni, Syll. Alg., Vol. I, p. 339.

Spongomorpha Hystrix Strömfelt, Om Algvegetation vid Islands Kuster, p. 54.

? *C. Sonderi* Kützting, Phyc. Germ., p. 208.

Hauck, Deutsch. Meeresalg., p. 44.

? *Spongomorpha Sonderi* Kützting, Tab. Phyc., Vol. IV, p. 17, Pl. LXXIX.

Fronds rich green, in rather dense tufts, filaments straight, branches very erect, except in the lower part of the older fronds, where they are more open; about 100 μ diameter at the base, increasing in size upwards, the end cell of the young, vigorously growing filaments sometimes reaching a diameter of 250 μ ; cells generally one half to one and one half diameters long, the terminal cell sometimes four diameters. Rhizoidal descending filaments fairly common in the older parts, 40–60 μ diameter, cells 3–10 diameters long.

Resembling a luxuriant *C. arcta*, but the filaments are larger, the cells shorter, the tufts less matted. It has been found at Newfoundland, Isaac Holden; Nahant, Mass., Peak's Island, Maine.

The description given above is based on the Nahant and Newfoundland specimens, and does not agree exactly either with Ström-

felt's description of *Sponogomorpha Hystrix* or with Kützing's of *Cladophora Sonderi*. Strömfelt's plant, however, appears to differ from ours merely in being more luxuriant, the filaments reaching a diameter of $225\ \mu$ in the lower part, $360\ \mu$ in the upper part, with cell lengths in proportion; the only other character mentioned is that the filaments are often variegated by empty cells alternated with the normal ones. This is hardly a definite character, but is likely to occur from external causes. The variegated character is not noticeable in a specimen of Rosenvinge, from Godthaab, Greenland, No. 162, which in all other respects agrees perfectly with Strömfelt's description.

As regards *C. Sonderi*, the case is not quite so clear; the original description in the Phycologia Germanica reads "Aeste gleichhoch, an der Spitze $\frac{1}{30}-\frac{1}{26}''$, unten bis $\frac{1}{15}''$ dick; Glieder meist so lang als das Durchmesser, unten bisweilen doppelt länger, oben oft halb so lang." This would indicate that the filaments were twice as large in the basal part as at the tip, but the figure of *Sponogomorpha Sonderi* in the Tabulae Phycologicae shows no such distinction, the upper part being a trifle larger, but only a trifle. If the original description is correct, the species does not belong in *Sponogomorpha* at all: if the plate is correct, it would seem that Kützing's name should be retained. I have not been able to examine an authentic specimen, but I have received from Reinbold a specimen from Helgoland, the original locality, which he has marked *C. Sonderi*; it has short joints and filaments largest at the tip, but the size of the filaments is less than in the American plant, thus approaching *C. arcta*.

The largest dimensions are found in specimens from the extreme north, Greenland and Iceland; it may be best to consider it as an arctic species, diminishing in size as it ranges south, and at Helgoland, its extreme southern limit as to conditions though not in latitude, only slightly exceeding *C. arcta*. The latter species has a wider range, plants growing in Greenland and Iceland being practically identical in character and size with plants from the English Channel or from Long Island Sound. That the typical *C. arcta* is found at Iceland in company with but distinct from *C. Hystrix*, speaks strongly for their being distinct species.

C. SPINESCENS Kütz.

Kützing, Species Algarum, p. 418.

C. arcta var. *centralis* Collins, Holden & Setchell, Phyc. Bor.-Am., No. 721.

Sponogomorpha spinescens Kützing, Tab. Phyc., Vol. IV, p. 16, Pl. LXXVIII.

Main filaments about $80\ \mu$, cells $\frac{1}{2}$ -1 diam., growing tips up to $100\ \mu$ diam., cells 2 diam. long. Branches either erect and somewhat clavate, or patent and acute; branches of the latter type either short and spine-like or long, hooked, revolute or even circinate. The

descending rhizoidal filaments are not uncommon, but the matting together of the fronds is due more to the peculiar hooked branches.

From *C. arcta*, under which it is included by most authors, it differs by the acute hooked branches, shorter joints, and the less fastigate character of the frond. This last character, though apparently constant in American specimens, is not uniform in European forms, some of them being reported as quite level topped. In *C. arcta*, except in older stages, the flat or rounded top of the frond is very noticeable, while the American *C. spinescens*, even in the younger stages, has more the form of rope-like, many times branched fronds; somewhat like *Ectocarpus tomentosus*. *C. arcta* is a plant of early spring, and grows on rocks; *C. spinescens* is nearly always epiphytic, and is in excellent condition in July, when only battered forms of *C. arcta* are to be found.

It has been collected by the writer at Nahant, Mass., at St. George's Bay, at Pemaquid, and at Mt. Desert, Maine.

C. LANOSA (Roth) Kütz.

Kützling, Phyc. Gen., p. 269.

Harvey, Phyc. Brit., Pl. VI; Nereis Bor.-Am., part 3, p. 76.

Le Jolis, Alg. Mar. Cherb., p. 63.

Farlow, N. E. Marine Algae, p. 51.

Hauck, Deutsch. Meeresalg., p. 447.

De Toni, Syll. Alg., Vol. I, p. 336.

Hauck & Richter, Phyc. Univ., No. 276.

Collins, Holden & Setchell., Phyc. Bor.-Am., No. 661.

Farlow, Anderson & Eaton, Alg. Am.-Bor. Exsicc., No. 204.

Conferva lanosa Roth, Cat. Bot., Vol. III, p. 291.

Filaments 30-40 μ diam., light green, cells 2-6 diam. Fronds fastigate, branches erect, blunt, more or less matted at the base by descending rhizoidal filaments, slightly smaller than the main filaments. Epiphytic on various algae.

This species is quite distinct, and has been maintained unchanged since its establishment in 1806. It is found along the whole New England coast. It appears in April, is in good condition in May and June; in the latter part of June and in July the fronds become detached, and float ashore in the form of soft, round, pale green tassels, two or three centimeters in diameter.

C. LANOSA var. *UNCIALIS* (Fl. Dan.) Thuret.

Thuret in Le Jolis, Alg. Mar. Cherb., p. 63.

Farlow, N. E. Marine Algae, p. 51.

Hauck, Deutsch. Meeresalg., p. 447.

De Toni, Syll. Alg., Vol. I, p. 336.

Collins, Holden & Setchell., Phyc. Bor.-Am., No. 77.

C. uncialis Harvey, Phyc. Brit., Pl. CCVII; Nereis Bor.-Am., part 3, p. 77.

Conferva uncialis Fl. Dan., Pl. DCCLXXI, fig. I.

Tufts irregular in outline, not fastigate except in early stages. Growing on rocks.

In size and character of filaments hardly distinguishable from the type, but forming, when well developed, irregular tufts, reminding one of *C. spinescens*. It is saxicolous, and the fronds do not float away bodily at maturity, like *C. lanosa* type, but persist in a battered and unattractive state through the summer. It is found along the whole New England coast.

SUB-GENUS EUCLADOPHORA.

All branches similar, not increasing in size upwards, terminal cell short, adult cells not subdividing.

C. ALBIDA (Huds.) Kütz.

Kützing, Phyc. Gen., p. 267.

Harvey, Phyc. Brit., Pl. CCLXXV; Nereis Bor.-Am., part 3, p. 80.

Le Jolis, Alg. Mar. Cherb., p. 59.

Farlow, N. E. Marine Algae, p. 51.

Hauck, Deutsch. Meeresalg., p. 458.

De Toni, Syll. Alg., Vol. I, p. 525.

Conferva albida Hudson, Flora Anglica Ed. 2, p. 595.

Fronds soft, dense, pale green, filaments 20–30 μ^1 diam., cells 4–5 diam., delicate; branching irregular, ultimate ramuli long, patent, blunt.

Rather common in southern New England, usually easily distinguished by the spongy character of the frond and the slender filaments.

C. ALBIDA var. *REFRACTA* (Wyatt) Thuret.

Thuret in Le Jolis, Alg. Mar. Cherb., p. 60.

Collins, Holden & Setchell, Phyc. Bor.-Am., No. 720.

Cladophora refracta Harvey, Phyc. Brit., Pl. XXIV; Nereis Bor.-Am., part 3, p. 79.

De Toni, Syll. Alg., Vol. I, p. 324.

Conferva refracta Wyatt, Algae Danmonienses, No. 228.

Like the type in character of frond and size of filaments, but with recurved branches in the upper part of the frond, set with recurved ramuli. *C. refracta* has similar branches and ramuli, but is a much coarser plant. Some forms of *C. flexuosa* are puzzling, but the main branches in the latter are larger than anything in *C. albida*, and neither *C. refracta* nor *C. flexuosa* has the spongy substance of *C. albida*. It occurs probably all along the New England coast, but

¹ When the diameter of the filament is given in this form, for species of the subgenus Eucladophora, the larger dimensions are for the main filaments, the smaller for the ramuli; in the subgenus Spongomorpha the normal branches increase in size upward, and the larger dimensions refer to the tips.

is more common in the south. There has been much confusion as to the plant to be called *C. refracta*; there seems to be no way of ascertaining what was Roth's *Conferva refracta*, but Wyatt's plant is without much doubt a variety of *C. albida*.

C. RUDOLPHIANA (Ag.) Kütz.

Kützling, Phyc. Gen., p. 268.

Harvey, Phyc. Brit., Pl. LXXXVI; Nereis Bor.-Am., part 3, p. 80.

Farlow, N. E. Marine Algae, p. 54.

Hauck, Deutsch. Meeresalg., p. 457.

De Toni, Syll. Alg., Vol. I, p. 321.

Collins, Holden & Setchell, Phyc. Bor.-Am., No. 267.

Conferva Rudolphiana Agardh, Flora, 1827, p. 636.

Fronds long and loose, yellowish green, gelatinous, branches often opposite, patent, flexuous, ultimate ramuli secund, tapering; cells 20-60 μ diam., much longer than broad, sometimes up to 20 diameters.

A plant of warm, shallow bays chiefly, growing on stones or algae, below low water mark, often in large quantities; the individual fronds sometimes a meter in length, always soft and gelatinous. It is common from Nantucket to New York, but only occasionally found north of Cape Cod; the northernmost point being Kennebunkport, Maine. Herbarium specimens of *C. Rudolphiana*, *C. albida* and some forms of *C. gracilis* are not always readily to be distinguished, microscopic characters only being available; but the living plants can usually be recognized. *C. albida* is very soft and spongy; *C. Rudolphiana* soft but not spongy; *C. gracilis*, even in its slenderest forms, has a certain harshness to the touch, as compared with the two other species.

C. GLAUDESCENS (Griff.) Harv.

Harvey, Phyc. Brit.; Pl. CXCVI; Nereis Bor.-Am., part 3, p. 77.

Le Jolis, Alg. Mar. Cherb., p. 60.

Farlow, N. E. Marine Algae, p. 52.

Hauck, Deutsch. Meeresalg., p. 460.

De Toni, Syll. Alg., Vol. I, p. 320.

Farlow, Anderson & Eaton, Alg. Am.-Bor. Exsicc., No. 205.

Collins, Holden & Setchell, Phyc. Bor.-Am., No. 817.

Conferva glaucescens, Griffiths in Wyatt, Alg. Danm., No. 195.

Fronds 10-40 cm. long, loosely tufted, glaucous or yellowish green, much branched, ultimate ramuli long, erect, acute, sometimes secund, filaments delicate, 30-60 μ diam.

A plant of spring and early summer, found all along our coast and extending south to Florida and north to Labrador. It grows both in quiet bays and in tide pools on rocky shores, especially upper pools where the water becomes quite warm from the sunshine between one high tide and another. In these pools the natural bright glaucous

green is changed in the upper part of the frond to yellowish green or almost white.

The *C. glaucescens* of the Phycologia Britannica is figured and described as having articulations uniformly near three diameters. The plant of northern New England has cells usually 4–6, sometimes even 12 diameters, agreeing with Hauck's description. This difference in the length of the articulations is of little importance, other characters being identical.

C. FLEXUOSA (Griff.) Harv.

Harvey, Phyc. Brit., Pl. CCCVIII; Nereis Bor.-Am., part 3, p. 78.

Le Jolis, Alg. Mar. Cherb., p. 60.

Farlow, N. E. Marine Algae, p. 54.

Hauck, Deutsch. Meeresalg., p. 456.

De Toni, Syll. Alg., Vol. I, p. 311.

Farlow, Anderson & Eaton, Alg. Am.-Bor. Exsicc., No. 206.

C. gracilis Collins, Holden & Setchell, Phyc. Bor.-Am., No. 724.

Not typical.

Conferva flexuosa Griffiths in Wyatt, Alg. Danm., No. 227; not of Dillwyn nor Jürgens.

Light green, fronds 10–20 cm. high, main filaments 80–120 μ diam., branches 40–80 μ , quite regularly flexuous, bearing alternate or secund, curved and sometimes refracted ramuli; articulations in branches 2–3 times as long as broad, in main stems up to 6 diam.

Growing chiefly in rock pools, usually nearer low water mark than *C. glaucescens*, from which it is also distinguished by a firmer texture, less luxuriant branching, curved ramuli, and uniformly flexuous filaments. It is not so easy to distinguish well developed plants of *C. flexuosa* from small forms of *C. gracilis*, *C. hirta* or *C. lactevirens*, but normal forms can be fairly well made out, by the difference in the size of the filaments. It occurs all through our range, and as far north as the Gut of Canso, Macoun, and is in its best estate in July.

C. FLEXUOSA forma **densa** Collins ms.

Branching of all orders very dense, texture of frond spongy.

In habit much like *C. albida*, but in dimensions of cells and form of branches like typical *C. flexuosa*. Found growing in dense masses at low water mark, Easton's Point, Newport, R. I.

C. GRACILIS (Griff.) Kütz.

Kützling, Phyc. Germ., p. 215.

Harvey, Phyc. Brit., Pl. XVIII; Nereis Bor.-Am., part 3, p. 81.

Farlow, N. E. Marine Algae, p. 55.

Hauck, Deutsch. Meeresalg., p. 457.

De Toni, Syll. Alg., Vol. I, p. 322.

Farlow, Anderson & Eaton, Alg. Am.-Bor. Exsicc., No. 209.

Conferva gracilis Griffiths in Wyatt, Alg. Danm., No. 97.

Fronds up to 30 cm. long, yellowish or glaucous green, main filaments up to 160 μ diameter, irregularly bent, branching at the angles,

the branches more slender, beset at the tips with long, secund, attenuate, acute branchlets, 40–60 μ diam., cells 3–5 diam.

It is very difficult to give a description of this species that will enable a stranger to recognize it, and yet, in its typical form, it is fairly distinct. It is very variable, passing into *C. flexuosa*, *C. hirta* and *C. lactevirens*. In its typical form it has not the uniformly flexuous filaments of the first, the abundant short ramuli of the second, nor the stout fastigiate ramuli of the third; but forms partaking in greater or less degree of all these characters are only too common. North of Cape Cod the prevailing form is elongated, with very erect branches; this form is occasionally found south of Cape Cod, but the more common form has more patent branching, giving quite a different aspect, though there are no technical distinctions. Farlow's description in the N. E. Marine Algae fits best with the southern form, as does also No. 209, Alg. Am.-Bor. Exsicc., quoted above; this southern form is nearer *C. flexuosa* than the northern form. No. 206 of the same is quite typical *C. flexuosa*; No. 724 of Phyc. Bor.-Am. is between the two, but should be ranged under *C. flexuosa* rather than, as distributed, under *C. gracilis*.

It is a summer and autumn plant, preferring sheltered places, sometimes occurring in large quantity in muddy bays and harbors, and it is found all along our coast. One form and two varieties can be distinguished by name.

C. GRACILIS forma elongata Collins.

Collins, Holden & Setchell, Phyc. Bor.-Am., No. 725.

Fronds attached, with few and erect branches, stretching out on the surface of the water for a meter or more; color very glaucous green.

An extreme development of the ordinary northern form, apparently conditioned by its location, shallow warm water pools, on islands in Penobscot Bay, Maine.

C. GRACILIS var. EXPANSA Farlow.

Farlow, N. E. Marine Algae, p. 55.

Frond soon detached, forming loose floating masses, irregularly branched.

With the habit of *C. expansa*, but not forming a dense felt, floating loosely in the water of tide pools etc.; Gloucester, Nahant, Mass., W. G. Farlow; Cape Rosier, Maine, F. S. Collins.

C. GRACILIS var. vadorum (Aresch.)

C. gracilis var. *tenuis* Thuret in Le Jolis, Alg. Mar. Cherb., p. 61.
Farlow, N. E. Marine Algae, p. 55.

Conferva vadorum Areschoug, Alg. Exsicc., No. 19.

Filaments slender, 40–100 μ , branches few, articulations 4–8 diam.

Forming indefinite masses below low water mark, Gloucester, Mass.. Farlow; Atlantic City, N. J., S. R. Morse.

Areschoug's name having been published in 1840, it would seem

that it should be retained as a varietal name, in preference to Thuret's var. *tenuis*, published in 1863.

C. *HIRTA* Kütz.

Kützing, Phyc. Germ., p. 208.

Le Jolis, Alg. Mar. Cherb., p. 60.

Hauck, Deutsch. Meeresalg., p. 456.

De Toni, Syll. Alg., Vol. I, p. 329.

Collins, Holden & Setchell, Phyc. Bor.-Am., No. 726.

Filaments rather stiff, 50–200 μ diam., more or less bent, more or less branched, beset throughout or nearly so with short, usually secund, subacute ramuli; articulations 2–4 diam., rarely 6.

Somewhat resembling *C. gracilis* and probably having passed under that name; but it is coarser than most forms of the latter, and has not the long slender ramuli at the tips of the branches. The extent of ramification varies much, some forms having filaments a decimeter long with no branches other than the short ramuli which occur, several on one side and several on the other, or sometimes nearly all on one side, over the whole or the greater part of the frond. Sometimes the tip of a branch is quite bare, while all the lower part has the secund ramuli.

It occurs throughout our range, mostly in rather exposed places, but seems to be not so common as some other species; this, however, may be due to its having only recently been distinguished from *C. gracilis* in this country.

C. *EXPANSA* (Mert.) Kütz.

Kützing, Tab. Phyc., Vol. III, p. 27, Pl. XCIX.

Le Jolis, Alg. Mar. Cherb., p. 61.

Farlow, N. E. Marine Algae, p. 55.

Hauck, Deutsch. Meeresalg., p. 462.

De Toni, Syll. Alg., Vol. I, p. 319.

Farlow, Anderson & Eaton, Alg. Am.-Bor. Exsicc., No. 210.

Collins, Holden & Setchell, Phyc. Bor.-Am., No. 121.

Conferva expansa Mertens in Jürgens, Decade 8.

Fronds dull green, loosely branched, the main branches 100–150 μ diam., flexuous, with smaller, patent, secondary branches, divaricately divided; ultimate ramuli 40 μ diam. secund, blunt, articulations 3–6 diam.; at first attached but soon loosened and floating.

Common in shallow pools and especially in lagoons where the water is warm and the level varies little; here it forms a thick felty coating on the surface of the water, usually in company with *Lyngbya aestuarii* and species of *Enteromorpha*. It is found throughout our whole range.

C. *EXPANSA* var. *GLOMERATA* Thuret.

Thuret in Le Jolis, Alg. Mar. Cherb., p. 61 (without description).

Ultimate ramuli in closely set tufts; quite different in habit from the type, but evidently not specifically distinct.

Bridgeport, Conn., Isaac Holden.

C. FRACTA forma **MARINA** Hauck.

Hauck, Deutsch. Meeresalg., p. 461, excluding synonymy.

Hauck & Richter, Phyc. Univ., No. 68.

C. fracta Harvey, Phyc. Brit., Pl. CCXCIV; Nereis Bor.-Am., part 3, p. 83, as to marine forms.

Le Jolis, Alg. Mar. Cherb., p. 59.

Farlow, N. E. Marine Algae, p. 56; not of list of algae of Southern N. E.

Tufts irregular, dull green; filaments somewhat stiff, 80-120 μ diam., sparingly and somewhat dichotomously divided; branches spreading, angularly bent, with few and irregular quite blunt ramuli; articulations usually 3-6 diam.

C. fracta is an abundant and very variable species in fresh water, the world over, but occurs only occasionally in salt water, and may perhaps be considered less a true marine plant than as a stray form, out of its normal element. Still it does occur in submarine and even distinctly marine stations on many coasts, and must have a place in any marine list. Its nearest ally is *C. expansa*, a more freely and regularly branched plant; characteristic forms can readily be distinguished, but there are many forms, especially old and worn individuals, where the line is hard to draw. Indeed, old and battered specimens of any species of *Cladophora* make fairly good *C. fracta*.

C. FRACTA forma **flavescens** (Harv.).

C. flavescens Harvey, Phyc. Brit., Pl. CCXCVIII.

Filaments more slender than in the type, usually 30-60 μ diam.; articulations 6-10 diameters, ultimate ramuli tapering but with blunt tips; forming dense floating masses in high, warm pools.

Marblehead, Mass.; Rockaway, Long Island, N. Y.

C. MAGDALENÆ Harv.

Harvey, Phyc. Brit., Pl. CCCLV, A.

Le Jolis, Alg. Mar. Cherb., p. 59.

Farlow, N. E. Marine Algae, p. 56.

De Toni, Syll. Alg., Vol. I, p. 325.

Collins, Holden & Setchell, Phyc. Bor.-Am., No. 572.

Fronds short, coarse, dull green, matted, procumbent, with patent, flexuous branches, which have a few irregularly arranged, curving ramuli; filaments 60-100 μ diam., articulations 2-4 diam.

In some respects seeming like a form of *C. fracta*, but apparently as distinct as can be ordinarily expected of a *Cladophora*. It grows among other algae between tide marks, creeping in entangled masses. It has been found only in two localities; Napatree Point, R. I., D. C. Eaton; Milford, Conn., Isaac Holden.

C. REFRACTA (Roth) Areschoug.

Areschoug, Alg. Exsicc. Scand., No. 338; not Phyc. Brit., Pl. XXIV nor De Toni, Syll. Alg., Vol. I, p. 324.

Farlow, N. E. Marine Algae, p. 52.

Farlow, Anderson & Eaton, Alg. Am.-Bor. Exsicc., No. 207.

Collins, Holden & Setchell, Phyc. Bor.-Am., No. 573.

C. hamosa var. *refracta* Hauck, Deutsch. Meeresalg., p. 457.

Hauck & Richter, Phyc. Univ., No. 272.

? *Conferva refracta* Roth, Cat. Bot., Vol. II, p. 193.

Filaments rather stiff, 40-120 μ diam., articulations 2-3 diam., glaucous green; branches flexuous, the secondary branches and those of subsequent orders at first erect, then reflexed; ultimate ramuli often secund, blunt.

A common form in rocky pools throughout our whole range, and not very variable. It has a characteristic habit, not easy to describe, but recognized without much difficulty, even in mounted specimens, when once known; but forms of *C. flexuosa* sometimes resemble it pretty closely.

There is uncertainty as to what *Conferva refracta* Roth really was, but the *Cladophora refracta* of Areschoug seems to be a fairly distinct species, while the *C. refracta* of French algologists is apparently a variety of *C. albidula*.

C. RUPESTRIS (L.) Kütz.

Kützling, Phyc. Gen., p. 270.

Harvey, Phyc. Brit., Pl. CLXXX; Nereis Bor.-Am., part 3, p. 74.

Le Jolis, Alg. Mar. Cherb., p. 63.

Farlow, N. E. Marine Algae, p. 51.

Hauck, Deutsch. Meeresalg., p. 452.

De Toni, Syll. Alg., Vol. I, p. 328.

Collins, Holden & Setchell, Phyc. Bor.-Am., No. 728.

Conferva rupestris Linnaeus, Syst. Nat., Edit. 12, Vol. II, p. 721.

Filaments dark green, 80-150 μ diam., articulations 3-4 diam.; fronds densely tufted, much branched, the branches opposite or in fours, erect, ultimate ramuli short, blunt or slightly subulate.

In the confusion that exists in this unhappy genus, it is pleasant to find one species about which there can be no mistake, and *C. rupestris* is nearly unmistakable, with its dense, dark, stiff tufts with opposite or whorled branches. It is a rather handsome plant while growing, but herbarium specimens seem coarse, and do not adhere well to paper. It grows on rocks near low water mark, often covered by Fuci, and seems to be in good condition all through the year, while most Cladophoras are spring and summer plants. It is common from Nahant north, and is also found at Gay Head, Farlow.

The plant is figured and described by Harvey as having subulate ramuli, but in most American specimens examined the ramuli are blunt; in a few cases only are they slightly acuminate.

C. LAETEVIENS (Dillw.) Harv.

Harvey, Phyc. Brit., Pl. CXC; Nereis Bor.-Am., part 3, p. 66.

Farlow, N. E. Marine Algae, p. 53.

C. laetevirens var. *glomerata* Le Jolis, Alg. Mar. Cherb. p. 82.

C. utriculosa var. *laetevirens* Hauck, Deutsch. Meeresalg., p. 455.

Conferva laetevirens Dillwyn, British Confervae, Pl. XLVIII, p. 66.

Filaments 50–150 μ diam., rigid, yellow green, much branched; branches erect, often opposite; ultimate ramuli short, obtuse or subacute, densely fastigate at the tips of the branches; fronds up to 20 cm. long, articulations of main branches 6, of ramuli 3 diameters.

A stout and rather coarse species, perhaps best distinguished by the dense tufts at the ends of the branches, with blunt ramuli not much smaller than the branches. It is found from Nahant north, in exposed lower pools or below low water mark, but does not seem to be very common. Battered forms of *C. gracilis* or *C. hirta* are not easily distinguished from it, though when in good condition there is little danger of their being confused.

C. HUTCHINSIAE (Dillw.) Kütz.

Kützling, Phyc. Germ., p. 210.

Harvey, Phyc. Brit., Pl. CXXIV.

Farlow, N. E. Marine Algae, p. 53.

Hauck, Deutsch. Meeresalg., p. 453.

De Toni, Syll. Alg., Vol. p. 314.

Conferva Hutchinsiae Dillwyn, Brit. Confervae, p. 65, Pl. CIX.

Fond rather glaucous green, up to 40 cm. high; filaments 120–300 μ diameter, stiff, flexuous, sparingly branched; ultimate ramuli few, second, blunt, constricted at the nodes, articulations 2–3 diam.

This species has considerably larger filaments than any other of the subgenus Eucladophora on our coast, and is not likely to be mistaken. There does not appear to be any authentic specimen of the type from New England, the one quoted by Farlow, N. E. Marine Algae, proving to be wrongly marked, and to belong to California. But it has been collected at Atlantic City, N. J., agreeing very well with the specimens distributed in the McCalla's Algae Hibernicae, No. 28, and Wyatt's Algae Danmonienses, No. 226, the main filaments equalling 300 μ diam., though not so densely branched as some of the French specimens.

From its occurrence on the New Jersey coast, there is reason to expect it in New England.

C. HUTCHINSIAE var. *DISTANS* (Ag.) Kütz.

Kützling, Sp. Alg., p. 392.

Hauck, Deutsch. Meeresalg., p. 453.

De Toni, Syll. Alg., Vol. I, p. 315.

C. diffusa Harv., Phyc. Brit., Pl. CXXX; Nereis Bor.-Am., part 3, p. 83.

Conferva distans Agardh, Syst. Alg., p. 120, 1824.

Conferva diffusa Dillwyn, British Confervae, Pl. XXI; not of Roth.

Main branches long, nearly bare of secondary branches; joints longer than in the type, nodes not constricted.

Habit quite different from the type, but otherwise similar. Found at Gloucester, Mass., and at Long Point, N. J., at which latter locality it is connected with the type by intermediate forms.

MALDEN, MASSACHUSETTS.

EXPLANATION OF PLATE 36. — *Cladophora arcta*: fig. 1, part of filament with descending rhizoids. *C. Hystrix*: fig. 2, tip of filament. *C. spinescens*: fig. 3, filament with recurved branch. *C. albida*: fig. 4. *C. Rudolphiana*: fig. 5. *C. glaucescens*: fig. 6. *C. flexuosa*: fig. 7. *C. gracilis*: fig. 8. *C. hirta*: fig. 9. *C. refracta*: fig. 10. *C. expansa*: fig. 11. *C. fracta*: fig. 12. *C. rupestris*: fig. 13. *C. Hutchinsiae*: fig. 14. *C. laetevirens*: fig. 15.

THE BLOOMING OF HEPATICAS.

HARRIET A. NYE.

THE question which of our early spring flowers is entitled to the honor of leading the floral procession is one which has been frequently discussed in various parts of New England. I am not aware, however, that there have been printed records regarding the actual dates at which the Hepatica and other early flowers bloom in central Maine. I submit, therefore, the following memoranda for comparison with the notes of other observers interested in the first appearance each year of these fore-runners of spring.

There is upon our farm a small, sunny opening, somewhat sheltered upon the north and west by woods. It is overgrown by scattered sumachs and blackberries and throughout the season yields numerous treasures to the botanist. In early spring it is a veritable flower garden and it is here that we find our earliest Hepaticas and Erythroniums. We are obliged, however, to go some distance from home for Arbutus.

The first spring flowers to greet us in 1893 were the Hepaticas, in full bloom April 19. I fail to find dates recorded in the year 1894 but in that year both the Hepatica and the Arbutus were rivaled in earliness by a dainty flower much less familiar because quite rare. While searching for Arbutus by the Messalonskee in Waterville the latter part of April, I unexpectedly came upon a few clusters of delicately fragrant whitish flowers the like of which I had never seen before nor have I since. It was plainly a member of the numerous and puzzling order Compositae but the absence of leaves baffled all

attempts at identification. Several weeks elapsed before I learned that it was the Sweet Coltsfoot, *Petasites palmata*. I found no *Arbutus* that day,— it was too early for them, — but I was satisfied.

The following year, 1895, the frail little Bloodroots were the harbingers of spring, blooming upon a lawn in Waterville, April 18. Hepaticas, however, were in full bloom by the roadside the following day, April 19. I heard of others finding *Arbutus* as early as April 18, but did not find them myself until April 28.

In 1896 Hepaticas bloomed April 21, followed two days later by *Arbutus* and by Yellow Erythroniums on the 24th.

In 1897 Hepatica buds were secured on the 12th of April, which bloomed in the house on the 15th. They were found in bloom out-of-doors April 19.

In 1898 Hepaticas bloomed out-of-doors on Easter, April 10. I also had Erythroniums in bloom April 13 of that year.

April 15 was the date on which Hepaticas were first found in bloom in 1899. By the 27th of the month Hepaticas and Erythroniums were passing their prime, and Trilliums, White Violets and Strawberries were in bloom.

In 1900 Hepatica buds gathered April 6, bloomed in the house April 10, while they were in full bloom in the open April 19, closely followed by Erythroniums on the 20th.

Last year, 1901, Hepaticas were in full bloom on the 16th of April, while this year they have broken the record by appearing in March. Clusters of buds removed to the house March 22 bloomed on the 26th, and were in prime condition upon our early Easter, March 30. While it must be admitted that these were 'forced,' yet large, magnificent ones, as fine as any I ever saw, were gathered in the field on April 2. *Arbutus* buds, very small indeed, yet showing signs of growth, were gathered April 1 and placed in water. To-day, April 5, some of them are bursting into bloom.

FAIRFIELD CENTER, MAINE.

TWO MORE RARE PLANTS FROM LAKE ST. JOHN, QUEBEC.—It was my good fortune last August to find a specimen of *Carex Katahdinensis*, Fernald, at "The Grand Discharge" or main outlet of Lake St. John. This, I believe, is the first time this new species has been found, aside from the original station at Mt. Katahdin

(see RHODORA iii. 171, June, 1901); and we may hope that the plant will turn up elsewhere in the northeastern provinces of Canada. At the Grand Discharge it was found in thin soil among bushes near the high water mark of the river.

The water of Lake St. John seemed to be last August unusually low, nearly twenty feet below the level of the spring floods. On the sandy bottoms of small bays, and on muddy shores of islands thus exposed, there occurred an abundance of *Juncus subtilis*, E. Meyer, (see RHODORA, iii. 228, September, 1901). It grows sometimes in broad dense mats with crimson foliage and numerous flowers; at other times in colonies of single individuals more strongly repent, with green foliage and fewer flowers. It did not remind me at all of *Juncus pelocarpus*, which also occurs in this region; it is surely a well-marked species. At Lake St. John it was in such select company as *Subularia aquatica*, L., *Littorella lacustris*, L., *Ranunculus Flammula*, L., var. *reptans*, E. Meyer. It is of interest to note that the plant was first observed by Michaux at Chicoutimi, fifty miles further down the Saguenay River.—EZRA BRAINERD Middlebury, Vermont.

SOME VERMONT AND NEW HAMPSHIRE PLANTS IN THE MIDDLE CONNECTICUT VALLEY,—I.

W. H. BLANCHARD.

THE territory which the writer has examined somewhat thoroughly is the eastern half of Westminster and Putney and the village of Bellows Falls in Vermont, and in New Hampshire that part of Walpole which is adjacent to Bellows Falls and the northern part of Westminster. The whole of Windham County is in his field, however. Readers interested in this region may well examine in connection with these notes the article by Mr. Fernald in RHODORA, iii. 232. Conclusions may be drawn later regarding the region. In this article trees and shrubs only are considered.

Menispermum canadense, L. Moonseed. Two stations on the bank of the Connecticut River in Westminster. Reported but once north of this, namely by Dr. Barrows at Claremont on both sides of the Connecticut.

Lechea minor, L. Vernon, Vermont; in a pastured mowing about a mile northeast of South Vernon Station. First time reported north of Hingham, Massachusetts.

Xanthoxylum Americanum, Mill. Prickly Ash. One station where it is native. As it is known to our "Root and herb doctors" it must be found occasionally.

Ceanothus Americanus, L. New Jersey Tea. Frequent on dry, sterile terrace banks of the Connecticut River. I have never seen it in any other place. It is reported northward to Olcott Falls.

Vitis bicolor, LeConte. Summer Grape. Occasionally found at the foot of cliffs from Fall Mountain opposite Bellows Falls to Vernon. Evidently near its northern limit.

Vitis Labrusca, L. Fox Grape. This species is native around the lily-pond in Vernon, and may be so on the railroad as far north as Central Park Station. It occurs in other places also, but as an escape from cultivation.

Acer saccharinum, L. (*A. dasycarpum*, Ehrh.). River or Silver Maple. This is abundant where its roots can reach the water of the Connecticut River, but it is rarely seen elsewhere.

Acer Negundo, L. Box Elder. This has become naturalized on the banks of the Connecticut River. It is abundant on the New Hampshire side just below the fall at Bellows Falls in "Dr. Goodell's Orchard" and is occasionally found in Westminster and below.

Staphylea trifolia, L. Bladder-nut. Abundant in spots on the bank of the Connecticut River. There are at least two stations in Westminster.

Rhus copallina, L. Margined Sumach. This Dwarf sumach is abundant in places for a mile from the Connecticut River. Prof. Jesup records it as rare in his region, which reaches nearly down to Bellows Falls.

Rhus glabra, L. Smooth Sumach. Frequent in the range of the Margined Sumach.

Rhus venenata, L. Poison Sumach. Abundant in Vernon swamps and less frequent farther north.

Prunus pumila, L. Sand Cherry. On the sandy shore of the Connecticut River at Dr. Goodell's orchard and Brattleborough. At Vernon it is found on the dry plain away from the river.

Rosa blanda, Ait. River or Smooth Rose. Abundant on the bank of the Connecticut River in Westminster. Reported also at Hanover, New Hampshire, and Fairlee, Vermont.

Rosa Carolina, L. Swamp Rose. Scarce; Rocky Hill Swamp, and Lily-pond Swamp, Westminster.

Pyrus arbutifolia, L. Red Chokeberry. (See RHODORA, iv. 55.)

Cornus circinata, L'Her. Round-leaved Dogwood. Frequent. Abundant on Fall Mountain. Jesup reports it only at Hanover, New Hampshire, and Hartford, Vermont.

Cornus paniculata, L'Her. Frequent in the northern part of Walpole and Westminster. Jesup reports it as rare and gives two stations, Charlestown and Plymouth, New Hampshire.

Nyssa sylvatica, Marsh. Pepperidge. Rocky Hill, Westminster, where only staminate trees grow, and on Fall Mountain, Walpole; also in Vernon. Jesup reports it only near Squam Lake, New Hampshire.

Viburnum Opulus, L. High Cranberry. Rare. Occurs as a low bush in Lily-pond Swamp, Westminster.

Lonicera glauca, Hill. Frequent in the northern parts of Walpole and Westminster, the only stations seen.

Cephalanthus occidentalis, L. Button-bush. Common in this region, but reported as less so further north.

Gaylussacia resinosa, Torr. & Gray. Huckleberry. Abundant on Fall Mountain and farther south; frequent in this region generally. The var. *glaucocarpa*, Robinson, occurs on Rocky Hill, Westminster, the only station yet reported in Vermont, and on Fall Mountain, Walpole, New Hampshire.

Vaccinium vacillans, Solander. Half-high Blueberry. Frequent. Reported as rare northward. Jesup gives three stations.

Andromeda ligustrina, Muhl. Common in Windham County, Vermont. This seems to be its northern limit. Jesup gives as stations for this plant only Sunapee Lake and Enfield, New Hampshire.

Kalmia latifolia, L. Mountain Laurel. In spots in the Connecticut Valley, one in Dummerston, one on Rocky Hill, Westminster, and one in the northern part of Rockingham. Sargent found it at Squam Lake. It occurs on the bank of West River from Brookline to Brattleboro.

Rhododendron canescens, Don. Mountain pink, Swamp pink. Abundant on dry banks on both sides of the Connecticut River about Bellows Falls; also occasional in swamps and on dry banks. Pastures in Stratton, Vermont are filled with it.

Ledum Groenlandicum, Oeder (*L. latifolium*, Ait.) Labrador Tea. Grout's Pond, Stratton, Vermont.

Sassafras officinale, Nees. Frequent from Bellows Falls southward in the immediate Connecticut Valley, where it makes considerable trees. Reported rare further north.

Lindera Benzoin, Blume. Spice-bush. Plentiful on two little brooks on the line between Putney and Westminster one-half mile from the Connecticut River. This is quite likely to be the northern limit. Prof. Jesup informs me that he has no trace of it. It grows in open pastures and kills back very badly, so that it seldom reaches four feet in height.

Dirca palustris, L. Wickopy. Scarce. Brook bordering the south side of Drewsville Plain, Walpole, and two stations in Westminster. If it were not scarce choppers would know of it, but they never do.

Celtis occidentalis, L. Hackberry. Four scattered trees on the bank of the Connecticut River, in Westminster. Reported as occasional to Wells River.

Platanus occidentalis, L. Buttonwood. Frequent on the banks of streams and apparently native.

Carya alba, Nutt. Shagbark. Occurs in spots from Charlestown, New Hampshire, southward, generally on rocky knolls and seldom more than a mile from the Connecticut River. Reported as far north as Windsor, Vermont.

Carya amara, Nutt. Pignut. This yellow-budded walnut and the one preceding it are the only ones seen in this region. Frequent in the Connecticut Valley.

Betula populifolia, Ait. Gray Birch. Perhaps this species attains its northern limit in Walpole and Westminster, where it is not rare. Abundant on Westminster Lower Street. Flint reports its northern limit as Westmoreland, New Hampshire.

Corylus Americana, Walt. Hazelnut. Abundant around Bellows Falls, but rare in Westminster and Putney. The beaked hazel, *C. rostrata*, Ait. is common.

Carpinus Caroliniana, Walt. Blue Beech. Frequent in the immediate valley of the Connecticut River.

Quercus alba, L. White Oak. Abundant, but seldom seen more than two miles from the Connecticut River.

Q. velutina, Lam. Black or Yellow Oak. Bark black outside, yellow inside. Abundant about Bellows Falls on both sides of the Connecticut River. Less frequent southward in Westminster and Putney. Same range as the white oak.

Q. ilicifolia, Wang. Scrub Black Oak. Around Bellows Falls on both sides of the river. It is quite likely that this is its northern limit. Reported at Brattleboro.

Q. prinoides, Willd. Abundant on the west face of Fall Mountain opposite Bellows Falls. None of this species has been found on the Vermont side of the river.

Castanea sativa, Mill., var. *Americana*, Gray. Chestnut. Grows in spots only, never scattered. These spots are few and near the Connecticut River. There is only one of them between Bellows Falls and Brattleboro. The northern limit of the species is reported at Claremont, New Hampshire, and Windsor, Vermont.

Populus deltoides, Marsh. Necklace Poplar. Grows close to the Connecticut River. Flint reports it as occurring no farther north than Westmoreland, but there are scattered trees as far north as Dr. Goodell's orchard opposite Bellows Falls. Here there is a staminate tree nearly five feet in diameter.

Pinus resinosa, Ait. Norway Pine. Drewsville Plain, Walpole, is the only locality where this species has been seen.

Juniperus communis, L., var. *Canadensis*, Loud. Plants covering a space from two to thirty feet in diameter occur quite frequently in Putney and Westminster. The species constantly appears in new places.

Juniperus Virginiana, L. Red Cedar. Formerly scarce, but trees are now springing up in most of the pastures of Putney and Westminster, although as yet dwarfish.

WESTMINSTER, VERMONT.

THE SENECA SNAKEROOT IN MAINE. — Several years ago Miss Kate Furbish informed me that she had examined undoubted material of *Polygala Senega* collected by Miss Electra C. Teague at Caribou, Maine. Upon this report the record of the species as a Maine plant has rested for ten years, although a specimen from Aroostook Falls, New Brunswick, in the same valley with Caribou, has long been in the Gray Herbarium. In September, last, while botanizing upon the gravelly terraces of the Aroostook River, at Fort Fairfield, Maine, I found the species locally in great abundance. Examination showed the plant to extend over a large strip of undisturbed terrace below the village, but to disappear as soon as the cultivated land was reached. It is thus probable that, prior to the

general clearing and cultivation of the alluvial belt near the Aroostook River, the Seneca Snakeroot was a common plant in the valley. — M. L. FERNALD.

CLATHRUS COLUMNATUS IN LAWRENCE, MASSACHUSETTS. — In November of last year Mr. F. H. Silsbee of Lawrence wrote me a description of a strange phalloid which had appeared in a flower pot that contained an oleander tree. He took it to be a columnar Clathrus — a tropical fungus which would not be expected to appear naturally in Massachusetts. The specimen which he described was somewhat damaged, and evidently had not secured its full and normal growth. Moreover, as sometimes happens with phalloids, the upper portion of the volva remained rather firmly attached to the upper part of the specimen, and somewhat obscured its features. Mr. Silsbee wrote in substance that "there were apparently five arms, porous, like *Mutinus caninus*. The lower part of the volva still showed a whitish, firm jelly, and apparently had a thin membrane originally extending in between the arms. The yellowish olive colored slime of the gleba contained oval spores about 5 by 2 μ . The odor like all of this class, was disgusting and sickening, but not nearly so powerful as that of Dictyophora. I presume this must be a Clathrus, but it was simply columnar without any trace of lattice work. It had been growing above ground some five or six weeks, but split open only a day or two before it was brought to me. There is another small one already started, which I will send you if it is of interest."

Nearly three weeks elapsed before I received this second specimen. It was not two inches long, had only three complete columns, and was still less perfectly developed than the first. There could be little hesitation, however, in referring the fungus to *Clathrus columnatus* Bosc, a tropical species, which is common also in Florida. A full treatment of it may be found in Dr. E. A. Burt's second paper on "The Phalloideae of the United States,"¹ from which the following is adapted.

Receptaculum consisting of 2 to 5 massive vertical columns separate below but joined together at the apex; columns cinnabar-red; gleba suspended from underneath the apex of the receptaculum. Odor very fetid. Plant 2 to 5 in. high. Growing in sandy soil.

¹ Botanical Gazette, XXII, 5, Nov. 1896, p. 388.

Reported from North Carolina, South Carolina, Georgia, Florida and Texas.

The variation in the number of columns has given rise to various species, of which Dr. Burt gives an extensive synonymy. Some of these appear under the generic name *Laternea*, a designation made to separate species with a columnar receptaculum from those in which it consists of anastomosing bars which form a large-meshed net-work, as in *Clathrus cancellatus* Tourn., an old world species of wide distribution, which has been found in the United States as far north as New York.

I have recently seen a colored drawing of a large specimen of *Clathrus columnatus* made in Florida by Mrs. A. M. Hadley of Manchester, New Hampshire, who kindly allowed a number of her admirable drawings of fungi to be exhibited at a meeting of the Boston Mycological Club. According to her observation, the species was common, and was easily discoverable in the woods by the simple method of following one's nose. — H. WEBSTER.

TWO NEW HYPERICUMS OF THE ADPRESSUM GROUP.

B. L. ROBINSON.

(Plate 37.)

FROM Mr. C. H. Bissell I have recently received an interesting *Hypericum* with the habit of *H. adpressum*, Bart. The plant is represented by two specimens, both showing flowers and early stages of the fruit as well as habit and foliage. They were found by Mr. Bissell on the Alcott Road, Southington, Connecticut. The most striking feature in which the plant differs from *H. adpressum* is the great breadth of the sepals, but examination shows other differences also, such as the number of stamens, the close punctation of the leaves, and the unintruded placentae. The stamens are much more numerous than in *H. adpressum* and are not separable into phalanxes as in that species. Efforts to place this plant in any other hitherto described species have failed and it seems best to describe it as new. It is a pleasure to dedicate the species to its discoverer, one of the most alert and careful amateur botanists in New England. The plant may be characterized as follows.

HYPERICUM Bissellii. Perenne herbaceum 4-5 dm. altum erectum glaberrimum; caulibus foliosis simplicibus vel in parte superiori plus minusve ramosis basi flexuosis teretibus a cortice brunneo tectis supra ancipitibus flavescentibus: foliis oblongis integerrimis erectis vel adscendentibus sessilibus in axillis proliferis obtusiusculis 2.5-3.5 cm. longis 3-5 mm. latis uninervis supra saturate viridibus non lucentibus subtus pallidi oribus creberrime punctatis: cymis terminalibus regulariter dichotomis 8 cm. latis circa 20-floris; ramulis-patente adscendentibus; bracteis ovatis, acutis 7-10 mm. longis; floribus in dichotomis solitariis erectis ad 1.5 cm. latis; pedicellis 2-4 mm. longis; sepalis valde inaequalibus, maximis late ovatis 1.3 cm. longis 8 mm. latis acuminatis subcordatis herbaceis 3-nerviis creberrime punctatis et basi pellucide glanduloso-lineatis; petalis obovato-oblongis obliquis apice rotundatis sed in latere uno cum mucrone pusillo munitis flavis 7 mm. longis; staminibus pernumerosis in phalanges non separabilibus; carpellis 3, styli ramis maturitate profunde divisis, capsula ovoidea acuminata 7 mm. longa uniloculare, placentibus 3 parietalibus nullo modo intrusis.—Collected by C. H. Bissell at Southington, Connecticut, 30 July, 1901, no. 4025. Type in the Gray Herbarium.

On the 15th of September, 1901, Dr. G. G. Kennedy, Mr. E. F. Williams, and Mr. M. L. Fernald collected on the sandy shores of Flax Pond, at Bourne, Massachusetts, two forms of *Hypericum adpressum* so different in biological character as to merit taxonomic recognition. In the one which corresponds to the typical form of *H. adpressum*, Bart. the rootstocks are relatively slender and repent sending up two or more stems from near the tip. The cortex is not at all spongy-thickened, and the leaves are linear to narrowly lanceolate-oblong and of a bright green color. The other plant may be described as follows.

H. ADPRESSUM, var. spongiosum. Quam forma typica robustius erectum 7 cm. altum; caule solitario in parte inferiori incrassato et more Decodonis a cortice crasso spongioso tecto; foliis oblongis quam illi formae typicae latioribus et saturiore viridibus.—Collected by G. G. Kennedy, E. F. Williams, and M. L. Fernald, in marshy borders of thickets on the sandy shores of Flax Pond, Bourne, Massachusetts, 15 September, 1901. Type in the Gray Herbarium.

Both of these forms were secured in considerable quantity and comparisons have embraced some two hundred specimens. Although collected late in the season the specimens show all the floral parts even occasional petals. Careful search, however, has failed to reveal any differences in the floral organs, fruit, or seed; and as the vegetative differences although marked do not appear to be entirely constant, it seems best to treat the new form as a variety rather than a species. That it does not represent merely a stage of development in the typical plant is sufficiently shown by the fact that both forms, grow-

ing near together, fruit simultaneously. It is probable that these are ecological varieties, that is, forms responding in a marked manner to environmental influences even during the development of a single generation. This would be difficult to prove except by cultures.

The differences are well shown by the accompanying plate, kindly drawn by Mr. F. Schuyler Mathews.

EXPLANATION OF PLATE 37 — *Hypericum Bissellii*: fig. 1, habit; fig. 2, expanded calyx; fig. 3, petal; fig. 4, cross-section of the ovary. *H. adpressum*: fig. 5, part of the stem; fig. 6, branched base; fig. 7, petal; fig. 8, expanded calyx; fig. 9, cross-section of the ovary; *H. adpressum*, var. *spongiosum*; fig. 10, part of the stem; fig. 11, spongy base of stem.

AN ANOMALOUS SKULLCAP.

M. L. FERNALD.

(Plate 38.)

JUDGE J. R. CHURCHILL has called the attention of the writer to a peculiar *Scutellaria* collected by him on the beach of the Aroostook River at Fort Fairfield, Maine. The plant was gathered as *S. galericulata* and a single specimen only was taken "for locality." A plant essentially identical with Judge Churchill's Fort Fairfield material had previously been collected by the writer in river-thickets at Masardis, seventy-five miles further up the Aroostook than Fort Fairfield. This material was passed without examination as *S. lateriflora*, but subsequent study of it in connection with the Fort Fairfield plant shows it to be of more than ordinary interest.

Its showy blue-violet flowers in the axils of the large leaves, though smaller than in that species, immediately suggest *S. galericulata*; but the thin primary leaves are ovate, long-acuminate, coarsely crenate-dentate, and on slender petioles, thus closely simulating those of *S. lateriflora*. This Aroostook River plant is, therefore, essentially intermediate in its characters between the two common species of New England. Combining thus the characters of two species the plant may be of hybrid origin. Yet the independent collection of specimens at remote points and in each case merely "for locality" suggests that the plant is common throughout the Aroostook Valley, and is to be regarded as analogous to certain other New England species, — *Circaea intermedia*, *Apocynum medium*, *Lysimachia producta*,

Lactuca Morssii, etc. — which combine to some extent the tendencies of other species of their respective genera.

The characters of this Aroostook Valley plant with which it is a pleasure to associate the name of the indefatigable botanical collector who first noted its peculiarities, are: —

SCUTELLARIA Churchilliana. Stems ascending from a slender rootstock, 3.5 to 6 dm. high, minutely pilose, freely branching even from the very base; the branches simple or forked, flexuous, loosely ascending or spreading, mostly 1.5 to 3 dm. long: leaves ovate-acuminate, very thin, glabrous above, minutely pilose on the nerves beneath; those of the primary stem 4 to 6 cm. long, coarsely crenate-dentate, on slender petioles nearly 1 cm. long; those of the branches smaller (1.5 to 3.5 cm. long) diminishing upwards, less coarsely toothed and on shorter petioles: flowers solitary in the upper axils: pedicels 1 or 2 mm. long: calyx during anthesis, 2.5 to 3 mm. long, puberulent: corolla 1 to 1.5 cm. long, pilose, blue-violet, narrow-funnelform, gradually enlarged upward, the lower lip somewhat exceeding the galea. — MAINE, thicket by Aroostook River, Masardis, Sept. 8, 1897 (*M. L. Fernald* — type in Herb. Gray); beach of Aroostook River, Fort Fairfield, Aug. 11, 1901 (*J. R. Churchill*).

In plate 38, Mr. F. Schuyler Mathews has brought out the habitual distinctions of the three species here discussed.

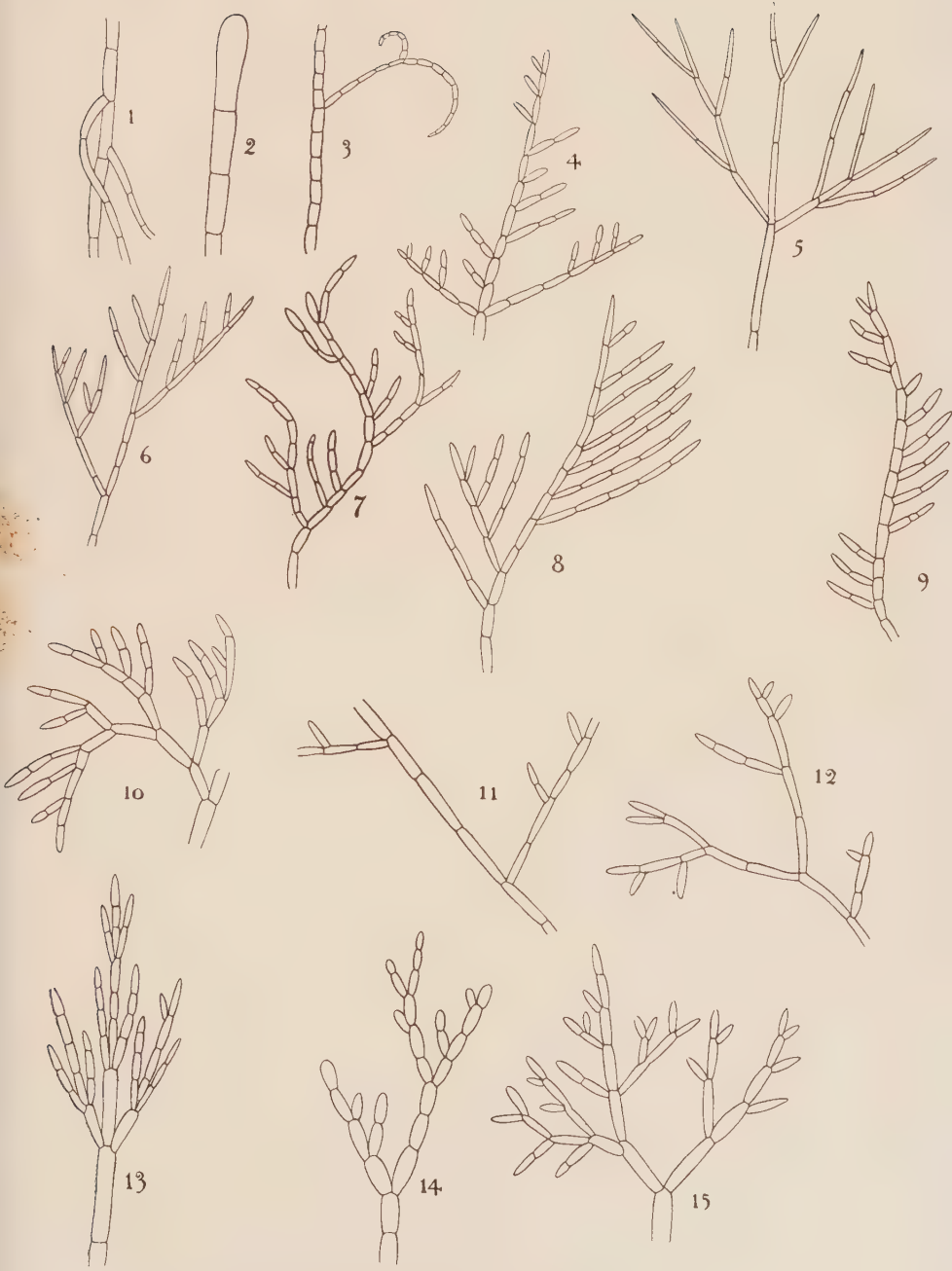
GRAY HERBARIUM.

EXPLANATION OF PLATE 38.— Fig. 1, upper portion of *Scutellaria Churchilliana*; fig. 2, upper node of *S. lateriflora*; fig. 3, upper node of *S. galericulata*.

THE VERMONT BOTANICAL CLUB will join the VERMONT BIRD CLUB in a field-meeting on the shores and islands of Lake Champlain, Thursday and Friday, July 3 and 4.

The plan is to make cruises in small steamers to the less accessible points about the lake, leaving Burlington at 8 A. M., July 3, and returning on the evening of July 4. But since it is necessary to know in advance the number who will make the cruise, all persons who are interested in the meeting should apply *at once* to Prof. L. R. Jones, Secretary, Vermont Botanical Club, Burlington, Vt., for a circular giving detailed information.

Vol. 4, no. 41, containing pages 87 to 110, was issued 9 May, 1902.



NEW ENGLAND CLADOPHORAS.



F. Schuyler Mathews del.

Figs. 1-4, *Hypericum Bissellii*; figs. 5-9, *H. adpressum*; figs. 10-11, *H. adpressum*, var. *spongiosum*.



F. Schuyler Mathews del.

Fig. 1, *Scutellaria Churchilliana* ; fig. 2, *S. lateriflora* ; fig. 3, *S. galericulata*.

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"There it was, the State of Maine, which we had seen on the map, but not much like that, — immeasurable forest for the sun to shine on, that eastern *stuff* we hear of in Massachusetts. No clearing, no house. It did not look as if a solitary traveller had cut so much as a walking-stick there. Countless lakes, — Moosehead in the southwest, forty miles long by ten wide, like a gleaming silver platter at the end of the table; Chesuncook, eighteen long by three wide, without an island; Millinocket, on the south, with its hundred islands; and a hundred others without a name; and mountains also, whose names, for the most part, are known only to the Indians. The forest looked like a firm grass sward, and the effect of these lakes in its midst has been well compared, by one who has since visited the same spot, to that of a 'mirror broken into a thousand fragments, and wildly scattered over the grass, reflecting the full blaze of the sun.'"

This is the immense forest-park which we invite you to explore. Here you may find a quiet retreat by pleasant waters, in the shelter of giant cliffs; or if a lean-to or bark-hut are not to your liking you can "put up" at one of the log-camps or lodges already built and ready to give you royal welcome to the simple and wholesome life of the Maine woods. If, however, you prefer to cling a little closer to civilization, you will find comfortable quarters and accommodating hosts in the villages scattered here and there along the line of the BANGOR & AROOSTOOK as it makes its way northward across the wilderness. And even at the hotels you will not find yourself very far from the Maine woods, for a walk of a few minutes will bring you to the verge of the "immeasurable forest."

If you are a lover of northern plants you will have rare pleasure in a tramp across country from your temporary home. If you have been familiar with the rocky oak-woods of southern New England, nothing

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can be more fascinating than the damp moss-carpeted evergreen forest, such as you will find occupying the low plains and the cool mountain slopes throughout Northern Maine. You can enter vast stretches of such forest on all sides of *Moosehead Lake* and throughout the *Katahdin Iron Works* region, and all along the main line of the railroad and its various northern branches. Here beneath the tall spruces are the rare plants for which at home you have made long and vain pilgrimages:—the tiny Mitre-wort, *MITELLA NUDA*, with its lace-like petals, the elusive Sweet-Coltsfoot, *PETASITES PALMATA*, one year blossoming in abundance, and then failing for years to show another of its fragrant heads, and the delicate Tway-blades, *LISTERA AURICULATA*, *CONVALLARIOIDES*, and *CORDATA*, rarely seen except by the botanist ready to creep in the moss. Here, too, you will make many new acquaintances:—the strange Spurred Gentian, *HALENIA DEFLEXA*, with its interesting bronze and greenish clustered flowers; the little white *PYROLA MINOR* for which you have hunted in the White Mountains, and nearby its handsome relative, *P. ASARIFOLIA* with glossy leaves and flesh-colored flowers. Then here are the Club-mosses, *LYCOPODIUM COMPLANATUM*, *SABINAEFOLIUM*, and *SITCHENSE*, species unknown to many save from herbarium-specimens.

In the region of *Fort Kent* and *Van Buren* these spruce woods shelter very many more species which it is worth while to see:—the largest of the Rattlesnake Plantains, *GOODYERA MENZIESII*, the rare Arctic Fleabane, *ERIGERON ACRIS*, the remarkable local Wood Betony, *PEDICULARIS FURBISHIAE*, unknown outside the St. John Valley.

Where the woods grow thin and the ankle-deep carpet of Hypnum changes to a knee-deep carpet of sphagnum, you will find yourself entering one of the Sphagnum-bogs which cover many thousand miles of Maine and New Brunswick. Here, for instance near *Sherman*, *Crystal* or *Island Falls* on the upper Mattawamkeag, or in hundreds of other similar areas to the west and north—in late May and early June the bog is a brilliant display of color: White foam—like masses of the spicy Labrador Tea, *LEDUM GROENLANDICUM*, rich rosy banks of the Pale Laurel, *KALMIA GLAUCA*, indefinite white waves of the Alpine Cotton-grass, *ERIOPHORUM ALPINUM*, brightened here and there with the deep yellows of *Cypripediums*. Later these bogs will repeat this show of colors in other fine displays: white in *TOFIELDIA* or in the Swamp Valerian, *VALERIANA SYLVATICA*, scattered among the Bog Birch, *BETULA PUMILA*, and the Swamp Honeysuckle, *LONICERA OBLONGIFOLIA*; rose in the splendid *CYPRIPEDIUM SPECTABILE*; and orange in the northern Squaw-weed, *SENECIO ROBBINSII*. But these showy plants are not alone the attractive features of the bogs, for search will reveal humbler and to the botanist more pleasing returns,—rare *CARICES*, *C. TENUIFLORA*, *GYNOCRATES*, and *VAGINATA*, or the little Sundew, *DROSERA LINEARIS*.

If instead of to the evergreen forest your path leads over an upland

BANGOR AND AROOSTOOK RAILROAD.

ridge with its deciduous covering of sugar-maple, beech, and birch, you will again be in a happy hunting ground, for here, in the upland woods between *Houlton*, *Presque Isle*, and *Fort Fairfield*, is the home of *DICENTRAS*, *CLAYTONIAS* and *DENTARIAS*, of *VIOLA SELKIRKII*, the Seneca Snakeroot, *POLYGALA SENEGA*, the woodland orchids, *HABENARIA HOOKERIANA*, and *H. BRACTEATA*, and other species which brighten the woods of spring and early summer.

The dense woods, however, are not always the best botanizing grounds, and so, even in northern Maine, their charm is enhanced by the presence of a river. If you follow the ledgy and gravelly banks of one of these northern streams,—as the *St. John* between the *Little Black* and the *Aroostook Rivers*, or the Aroostook itself between *Masardis* and the splendid gorge as the river approaches the *St. John*—you will be always alert, for every turn is apt to bring you to some new discovery. It may be a bank pink with the long racemes of *OXYTROPIS CAMPESTRIS*, var. *JOHANNENSIS*, or the equally handsome *HEDYSARUM BOREALE*, the globular heads of Chives, *ALLIUM SCHOENOPRASUM*, or the dainty evanescent flowers of *PRIMULA MISTASSINICA*. On some steep cliff by a water-fall you will see the rosettes of the Aromatic fern, *ASPIDIUM FRAGRANS*, the daisy-like heads of *ERIGERON HYSSOPIFOLIUS*, the glistening leaves of *SHEPHERDIA*, or the pink flowers of the rare *ANEMONE MULTIFIDA*. On the sandy beach you will find great thickets of northern willows, *SALIX GLAUCOPHYLLA*, etc., and a brilliant display of *ASTRAGALUS ALPINUS*, *TANACETUM HURONENSE*, and *PRENANTHES RACEMOSA*, interspersed with the less showy *EQUISETUM VARIEGATUM*, *TRIGLOCHIN PALUSTRIS*, and *JUNCUS ALPINUS*, var. *INSIGNIS*. Higher up the bank, on the talus-slope, are the delicate little Gentian, *GENTIANA AMARELLA*, var. *ACUTA*, and the handsome White Painted-Cup, *CASTILLEJA PALLIDA*.

If you follow the rivers you must not become so absorbed in the shore vegetation as to forget the aquatic plants. This is a land of lakes and ponds; and these and the channels by which they are emptied are often carpeted by plants too little known to the average botanist:—*MYRIOPHYLLUM FARWELLII* and *POTAMOGETON OBTUSIFOLIUS* in the *Piscataquis* and *Mattawamkeag Rivers* and their crystal-clear tributaries; and *MYRIOPHYLLUM ALTERNIFLORUM* and *JUNCUS SUBTILIS* in the *Mattawamkeag*, *Aroostook* and *St. John*.

The mountains of northern Maine, after all, are among the most fascinating regions for botanizing. If you have once lived on *Katahdin* you can never forget the wild grandeur of its Great Basin and the sheer cliffs and splendid Tableland. In exploring this most impressive of eastern mountains, one finds himself walking over broad carpets of the Alpine Bearberry, *ARCTOSTAPHYLOS ALPINA*, loaded with deep black berries, the depressed *RHODODENDRON LAPPONICUM*, gorgeous with rosy-purple flowers, the handsome *BRYANTHUS TAXIFOLIUS*, and the delicate pink-

BANGOR AND AROOSTOOK RAILROAD.

flowered *CASSIOPE* and the close-matted Alpine Azalea, *LOISELEURIA*. Then it is most thrilling to find in their alpine homes the other plants unknown on the lowlands, as *COMANDRA LIVIDA*, parasitic on the roots of alpine blueberries and crowberries, *CAREX SAXATILIS* and *KATAHDINENSIS* about alpine tarns, and *EPILOBIUM ANAGALLIDIFOLIUM* and *SAXIFRAGA STELLARIS*, var. *COMOSA*, hiding under cold wet boulders and cliffs.

But the greatest charm of the Maine woods for botanists is not in the regions which are now explored and whose vegetation is known. The regions of special interest are the hundreds of mountains, lakes and streams upon which no botanist has yet ventured. There you can go with the spirit of true discoverers, for everything you observe will be of some importance to science. These fields for real investigation are on all sides. For instance, there is only a very incomplete record of the vegetation about *Moosehead Lake*, and only two of its mountains, *Kineo* and *Squaw* have been botanically explored. Only three other large lakes in northern Maine have been visited by botanists and those — *Mattawamkeag*, *Squawpan*, and *Portage* — very superficially examined. No botanist knows *Schoodic*, *Seboois*, *Millinocket*, *Pamedumcook*, *Lobster*, *Chesuncook*, *Chamberlain*, *Caucomgomoc*, *Chemquasabamticook*, *Froid*, *Eagle*, and the countless other splendid waters like a "mirror broken into a thousand fragments and wildly scattered over the grass." Nor does he know the slopes, commanding summits and abysses of the *Sourdunahunk Mts.*, *Traveller*, *Moosilauke*, *Baker*, the *Spencers*, and the hundreds of others "whose names are known only to the Indians."

The northwestern section of Maine is essentially virgin territory; and no successful botanical trip has been made on the upper *St. Francis*. Yet within a few miles of this Maine border there are many northern plants which may well be watched for within New England territory. The botanist whose good fortune takes him to the upper *St. Francis* may watch with hope for *PLEUROGYNE CARINTHIACA*, *ERIPHORUM RUSSEOLUM*, *ASTRAGALUS ELEGANS*, *PARNASSIA PALUSTRIS*, *SAXIFRAGA CAESPITOSA*, *ANEMONE PARVIFLORA*, *CORNUS SUECICA*, *PEDICULARIS PALUSTRIS*, and many other arctic plants known closely to approach northern Maine.

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